

Calculating Storm Water Run-on at Construction Sites

Calculating storm water run-on for construction sites is an important step in preparing a project's Storm Water Pollution Prevention Plan (SWPPP). Run-on is water that comes from off-site locations that drain onto the construction site. The National Pollutant Discharge Elimination System (NPDES) General Construction Activity Permit, No. CAS000002, requires that a construction project's SWPPP show all calculations for anticipated storm water run-on and describe all Best Management Practices (BMPs) implemented to divert off-site drainage around or through the construction project. This bulletin will describe how to calculate storm water run-on.

Factors for Determining Run-On

The Rational Formula can be used to calculate storm water run-on flow to the site: $Q = 0.28CiA$.

Where: Q - run-on flow (m^3/sec).

C - run-off coefficient for drainage area (%).

i - rainfall intensity (mm/hour).

A - area draining onto the site (km^2).

This method is also described in the *Caltrans Storm Water Quality Handbooks, SWPPP/WPCP Preparation Guide* (Preparation Guide) Appendix E, (<http://www.dot.ca.gov/hq/construc/stormwater.html>) and the *Caltrans Highway Design Manual*, 5th edition, Index 819.2 (<http://www.dot.ca.gov/hq/oppd/hdm/chapters/t819.htm#i819-2>). Let's examine the factors necessary for using the Rational Formula.

Area Run-off Coefficient

The run-off coefficient represents the percent of water that will run off the ground surface during a storm. Values of the coefficient, "C", may be determined for undeveloped and developed areas. Coefficients for undeveloped areas are based on type of terrain, soil infiltration, vegetative cover, and surface storage. For developed areas, coefficients are based on the type of development that exists for the drainage area, commercial or residential, parks, lawns, streets, etc. Tables for determining the runoff coefficient are found in the *Caltrans Highway Design Manual*, Index 819.2. The design manual also provides methods for determining more complex run-off coefficients for drainage areas with mixed surfaces.

Area Rainfall Intensity

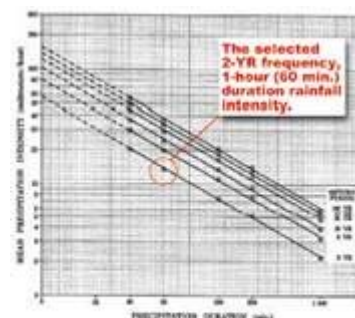
Rainfall intensity is the average rainfall intensity for the selected frequency. Refer to the local County Flood Control hydrology manual. For example, the hydrology manual for San Bernardino County is available from the Water resources Division of the San Bernardino County Flood Control District (909) 387-8213. This data is typically available on intensity-duration-frequency (IDF) curves for the selected frequency and duration. The Preparation Guide Appendix E uses the 2-year, 1 hour storm which should be adequate for temporary controls.

Drainage Area

Drainage area in square kilometers includes impervious and pervious areas and surfaces covered by buildings. This can be measured on the required vicinity map that shows the site area topography.

Calculating Site Run-On

When the factors are input with the correct units, the Rational Formula will result in a run-on flow in cubic meters per second. It is the responsibility of the SWPPP preparer to provide run-on calculations. However, this information may be available in the hydrology report, drainage report or other documents for the site. The Rational Formula method should not be used for drainage areas greater than $1.3 km^2$.



Typical intensity-duration-frequency curve.

The following is an example calculation where the site parameters are:

- The run-off coefficient for the drainage area is 0.32 (C); calculated using Table 819.2A of the Caltrans Highway Design manual.
- The rainfall intensity is 12.7 mm/hour (i); converted from 0.5 inches/hour obtained from the local county hydrology manual for a 2-year frequency storm with a one-hour duration.
- 0.71 km² area draining on to the site(A); measured from a USGS topographical map of the site area.

$$\text{Run-on flow} = 0.28 \times 0.32 \times 12.7\text{mm/h} \times 0.71\text{km}^2 = 0.81 \text{ m}^3/\text{sec}$$

Once the run-on flow is calculated, it must be considered for determining appropriate BMPs for diversion or conveyance of storm water around or through the site.

